

Order Heterosomata

1937

Body asymmetrical, strongly compressed, precaudal region short. Cranium normal behind, with twisted vertex in front to permit 2 eyes on same side, or one vertical and other lateral. Mouth more or less protractile, formed above on edges by premaxillaries only. Interorbital bar mainly formed by frontal of eyed side. Parietals separated by supraoccipital. Vertebral column of solid centra joined with arches. Pectoral arch joined to skull by forked

also ~~in~~ vertically down on opercle posteriorly. <sup>700</sup>  
T

post-temporal. Upper pharyngeals 4, third largest, much extended forward. Lower pharyngeals separate. Air bladder absent in adult.

Dorsal and anal long. Caudal with 17 rays, 15 branched, or fewer. Ventrals with 6 rays or less, thoracic or jugular.

A large group of fishes, remarkable for the asymmetrical development of color on one side of the body. In the very young both sides of the body are alike, one eye is placed on each side, the cranium normal and the

also preopercle border narrowly and preopercle spine slaty - bluish. Soft vertical fins, intertending region of tail and caudal peduncle all finely dotted with pale brown, dots not invading dark spots; edges of vertical fins also narrowly bluish; in young pale bluish bars are formed vertically from bases of soft dorsal and anal, over caudal peduncle and caudal base, also vertical fins with fewer and much larger blue spots. Pectoral brown. Ventral dusky brown and with bluish tinge along front edge.

Seychelles, East Indies. The adults or old examples have the soft dorsal and anal fins produced in rather long points, so that both extend backward beyond the end of the tail. Bleeker had but 2 examples 220 to 326 mm. long. In our small examples the head as well as the trunk are often pale in contrast with the rest of the body. Superficially <sup>adult</sup> the coloration, in pattern, is quite suggestive of the American Pomacanthus arcuatus. Our smallest example also shows a narrow gray-white line from occiput to base of preopercle spine and then back to ventral origin, bluish median line in front, 1 from occiput to front eye edge and down over front of cheeks, another from end of maxillary to

Fish swims erect.

1939

786

Depth  $1\frac{1}{2}$  to  $1\frac{3}{5}$ ; head  $3\frac{1}{4}$  to  $3\frac{3}{4}$ , width  $1\frac{2}{3}$  to  $1\frac{4}{5}$ . Snout  $2\frac{1}{8}$  to  $2\frac{3}{5}$  in head from snout tip; eye  $3\frac{1}{5}$  to 5,  $1\frac{1}{5}$  to  $1\frac{2}{3}$  in snout,  $1\frac{1}{4}$  to  $1\frac{7}{8}$  in interorbital; maxillary reaches nearly half way in snout, nearly to front nostril,  $3$  to  $3\frac{2}{5}$  in head; interorbital  $2\frac{1}{8}$  to  $3\frac{4}{5}$ , broadly convex; preopercle spine along inner edge  $2\frac{1}{2}$  to  $4\frac{1}{5}$ . Gill rakers 5 + 13, very short, small points, about  $\frac{1}{7}$  of gill filaments, which slightly longer than eye.

Scales 70 to 75 counted close along and above lateral line to caudal base; tubular scales about 50 to 56; 13 scales above lateral line, 33 or 34 below. Scales with 3 to 8 basal radiating striae; apical denticles 25 to 45, each with long slender root; circuli fine.

D. XIII, 21, I or 22, I, last spine  $1\frac{1}{4}$  to 2 in total head length, seventh ray  $2\frac{1}{5}$  to  $2\frac{7}{8}$  in combined head and body; A. III, 19, I or 20, I, third spine  $1\frac{2}{5}$  to  $2\frac{1}{8}$  in head, fifth ray  $2\frac{1}{4}$  to  $2\frac{3}{4}$  in combined head and body; least depth of caudal peduncle 2 to  $2\frac{1}{5}$  in head; caudal convex behind,  $1\frac{1}{8}$  to  $1\frac{1}{3}$ ; pectoral 1 to  $1\frac{1}{10}$ ; ventral  $2\frac{1}{3}$  to  $3\frac{2}{5}$  in combined head and body.

Largely uniform brown, though median area slightly paler. On trunk and tail most of larger scales each with large dark slaty or bluish spot. Dors brown. Border of gill-cover narrowly

# Analysis of Families

a.<sup>1</sup> Dorsal not extending forward on head, front rays spinous; eyes on right or left side; each ventral with spine and 5 soft rays. Psettodidae.

a.<sup>2</sup> Dorsal extending forward on ~~breast~~ head at least until over eye, none of rays spinous; ventral without spine.

b.<sup>1</sup> Preopercle edge free; lower jaw usually prominent.

c.<sup>1</sup> Eyes on left side (except in reversed specimens). Bothidae.

c.<sup>2</sup> Eyes on right side (except in reversed specimens). Pleuronectidae.

b.<sup>2</sup> Preopercle edge not free, hidden by skin and scales of head; lower jaw never prominent.

d.<sup>1</sup> Eyes on right side. Soleidae.

d.<sup>2</sup> Eyes on left side. Gnathoglossidae.

Crossorhombus dimorphus (Gilchrist)

Platophrys dimorphus Gilchrist,  
Marine Investig. South Africa, vol. 3,  
p. 10, pl. 27, 1905 (type locality:  $2\frac{1}{2}$   
miles off Umhlanga River mouth,  
 Natal, 22 to 26 fathoms). — Gilchrist  
and Thompson, Ann. Durban Mus.,  
vol. 1, pt. 4, p. 400, May 21, 1917 (reference).

Crossorhombus dimorphus Regan, Ann.  
Durban Mus., vol. 2, pt. 5, p. 212 (Natal).  
— Barnard, Ann. South African  
Mus., vol. 22, pt. 1, p. 386, June 1925  
(Natal, Zululand, Delagoa Bay, 3  
to 30 fathoms).

Platophrys grandisquama (not Schlegel)  
Gilchrist, Marine Investig. South Africa,  
vol. 4, p. 161, 1906.

Family Psettodidae

1941

Elongately ovoid, strongly compressed. Head moderate. Upper eye little advanced, on upper profile of head. Maxillary with well developed supramaxillary. Mouth large, lower jaw prominent. Teeth strong, pointed, equally developed in both sides of jaws. Palatines with teeth. Nasal openings on blind side scarcely higher than those of other side. Olfactory laminae transverse to radiating from central rachis. Preopercle edge free. No gill rakers. Vertebrae 24, of which 14 caudal. Scales rather small. Dorsal not extended forward on head, front rays feeble

Hepatus lineolatus (Valenciennes).

Acanthurus lineolatus Valenciennes, Hist.

Nat. Poiss., vol. 10, 1835, p. <sup>207</sup>~~152~~. Sea of the

Indies. — Bleeker, Nat. Tijds. Ned. Indie, deel 6, 1854, p. (90) 103 (Banda; Neira). —

Bleeker, Neth. Soc. Ind. Neerl., vol. 2, no. 7, 1857, p. 5 (Amboina). — Günther, Cat. Fish.

Brit. Mus., vol. 3, 1861, p. 336 (copied). —

Günther, Journ. Mus. Godeffroy, band 4, — 5, 1875, p. 112, plate 73, fig. A. (Raiatea and

Society Islands). — Pellegrin, Bull.

Soc. Zool. France, tome 39, 1914, p. 227 (Diego Suarez, Madagascar).

Hepatus lineolatus Fowler, Bishop Mus.

Bull., no. 22, 1925, p. 28 (Honolulu), p. 34

(Samoa). — Fowler and Ball, l.c., no. 26,

1925 (1926), p. 19 (Laysan, French Frigate Shoals and Johnston Island).

though spinous. Ventrals nearly  
symmetrical, with feeble spine  
and 5 soft rays.

Side of head striped and spotted  
yellowish olive through eye. No white  
on tail. Dorsal margin olive, narrowly  
black or blue? on edge, with 4 slaty  
stripes. Pectoral tip yellow.

5104. Sandakan Bay, Borneo. March 2,  
1908. Length 303 mm.

A1550 and A1553. Lan Wan, Formosa.  
January 25, 1910. Length 322 to 333 mm.

1943

Genus Psettodes Bennett

Psettodes Bennett, Proc. Zool. Soc. London, vol. 7, p. 147, 1831. (Type Pleuronectes belcheri Bennett, monotypic.)

Sphagomorus Cope, Trans. Amer. Philos. Soc., vol. 13, p. 407, 1866 (1869). (Type Pleuronectes erumei Schneider, monotypic.)

Body ovoid. Caudal peduncle distinct. Mouth very wide. Maxillary more than  $\frac{1}{2}$  head, extends far back. Each jaw with 2 rows of long, slender, curved, distant teeth, front ones of inner lower row longest and received in groove before vomer. Gill membranes scarcely united at throat. No gill rakers or only as clusters of minute spines. Scales ciliated. Dorsal and anal scaleless, depressible in scaly basal sheaths.

Caudal finely scaled. Dorsal begins at nape of neck, most rays like those of anal, branched.

Apparently two species.

Psettodes belcheri Bennett from West Africa is said to represent a distinct species with smaller scales. These are the most generalized of the flat fishes, with certain percoid characters suggesting ancestry from the primitive percoid stock.

A 1475. Cape Kait, Libani Bay, Celebes.

December 29, 1909. Length 525 mm.

Slaty brown, with darker lines, upon fading side of head and body with scattered bluish spots little larger than nostril. Yellow wash through eye bright, more or less yellow downward on frontal snout ridge and paler wash over side of head back to pectoral.

Dorsal and anal stripes pale slaty. Caudal spine with yellowish socket.

Pectoral bright yellow.

8859 and 8860. Raet Point. June 15, 1909.

Length 370 to 395 mm.

A 888 and A 886. Limbe Strait, Celebes.

November 10, 1909. Length 300 to 508 mm.

Slaty stripes on lavender olive ground color.

Psettodes erumei (Schneider)

1945

Pleuronectes erumei Schneider, Syst.  
Ichth. Bloch, p. 150, 1801 (type  
locality: Tranquebar).

Hippoglossus erumei Cuvier, Règne  
Animal, ed. 2, vol. 2, p. 569, 1829  
(— Rüppell, Neue  
Wirbelth., Fische, p. 84, 1835 (reference).  
— Cantor, Journ. Asiatic Soc. Bengal,  
vol. 18, pt. 1, pp. 1198, 1200, 1849 (1850)  
(Pinang Sea; Malay Peninsula).

(Rüppell, Atlas Reis. nördl. Afrika,  
Fische, p. 121, 1828 (Massana). —

Psettodes erumei Günther, Cat. Fishes  
Brit. Mus., vol. 4, p. 402, 1862  
(Singapore, China, Pinang, Japan,  
India); Fishes of Zanzibar, p. 112,  
1866 (Zanzibar). — Kner, Reise  
Novara, Fische, p. 282, 1865 (Java;  
Madras). — Bleeker, Atlas Ichth.  
Ind. Néerl., vol. 6, p. 4, pl. (1) 232,

1946

fig. 7, 1866-72 (Java, Madura, Sumatra,  
Pinang, Singapore, Bintang,  
Banda, Ambona). — Klunzinger,  
Verh. zool. bot. Gesell. Wien, vol.  
21, p. 570, 1871 (Red Sea). — Day,  
Fishes of India, pt. 3, p. 422, pl. 91,  
fig. 4, 1877; Fauna British India,  
Fishes, vol. 2, p. 439, fig. 155, 1889.  
— Alcock, Journ. Asiatic Soc. Bengal,  
vol. 58, pt. 2, no. 3, p. 280, 1889  
(Fake Point to Ganjam, 10 to 23 fathoms).  
— Regan, Journ. Bombay Nat. Hist.  
Soc., vol. 16, p. 330, 1905 (Persian Gulf).

— Jordan and Seale, Bull. Bur. Fisher.,  
vol. 26, p. 45, 1906 (1907) (Cavite). —  
— Evermann and Seale, Bull. Bur.  
Fishes, vol. 26, p. 106, 1906 (1907) (San  
Fabian). — Jenkins, Mem. Indian  
Mus., vol. 3, p. 23, 1910 ( ).

— Bean and Weed, Proc. U.S. Nat.  
Mus., vol. 42, p. 610, 1912 (Batavia).

1947

— Barnard, Ann. South African Mus., vol. 21, pt. 1, p. 383, pl. 17, fig. 1 (copied), June 1925 (Delagoa Bay).  
— Horman, Biol. Res. Endeavour, vol. 5, p. 221, 1926

Rec. Indian Mus., vol. 29, pt. 1, p. 8, text fig. 1, April 1927 (Santapali, Gopalpur, Madras, Orissa, Hughli River mouth, Abayab, Elephant Point, Mergui, Andamans; Persian Gulf; Muscat; Gulf of Oman). — Weber and Beaufort, Fishes Indo Austral. Archip., vol. 5, p. 97, fig. 24, 1929 (Tuban and Besuki, Java; Java Sea; Madura; Makassar, Celebes; Flores). — Fowler, Proc. Acad. Nat. Sci. Philadelphia, vol. 81, p. 615, 1929 (Hong Kong). — Tirant, Serv. Océan. Pêch. Indo Chine, 6<sup>e</sup> note, p. 172, 1929 (Phu Yen).

Pleuronectes nalaka Cuvier, <sup>1948</sup> Règne  
Animal, ed. 2, vol. 2, p. 340, 1829  
(on hooree nalaka Russell, Fishes  
of Coromandel, vol. 1, p. 60, pl. 77,  
1803; type locality: Vizagapatam).

Hippoglossus dentex Richardson, Zool.  
Voy. Sulphur, Fishes, p. 102, pl. 47,  
1843-45 (type locality: southern  
coast of China); Ichth. China Japan,  
p. 278, 1846 (China; Canton).

Hippoglossus orthorhynchus Richardson,  
Ichth. China Japan, p. 278, 1846  
(type locality: coasts of China; Canton).

Hippoglossus goniographicus Richardson,  
Ichth. China Japan, p. 279, 1846  
(type locality: coasts of China; Canton).

Bleeker, Nederl. Tijds. Dierk., vol.  
4, p. 130, 1873<sup>(1874)</sup> (reference). —

Psettodes goniographicus Chen, Biol.  
Bull. St. John's Univ., Shanghai, no.  
1, p. 89, Jan. 1931 (compiled).

1949

Hippoglossus quadrifasciatus van  
Hasselt, in Bleeker, Atlas Ichth.  
Ind. Néerl., vol. 6, p. 5, 1866-72.  
(type locality: Java; name in  
synonymy).

Depth  $2\frac{1}{6}$  to  $2\frac{1}{4}$ ; head  $3\frac{1}{10}$  to  $3\frac{1}{4}$ ,  
width  $2\frac{2}{3}$  to 3. Snout to lower eye  
 $3\frac{2}{3}$  to  $3\frac{4}{5}$  in head from snout tip;  
lower orbit  $6\frac{1}{2}$  to 7,  $1\frac{3}{4}$  to  $1\frac{4}{5}$  in  
snout, exceeds entire interorbital  
width; eye small, about  $\frac{1}{3}$  to  $\frac{2}{5}$  of  
orbit; maxillary extends beyond eye  
greater than length of orbit, expansion  
1 to  $1\frac{1}{5}$  in orbit, length  $1\frac{1}{3}$  to  $1\frac{2}{5}$  in  
head from snout tip; bony interorbital  
less than pupil. Gill rakers 6 + 9  
very low broad spinescent tubercles,  
barely  $\frac{1}{4}$  of gill filaments, which  
subequal with orbit.

Scales 58 to 60 in lateral line  
to caudal base and 5 to 7 more on  
latter; 22 to 24 above, 33 to 38 below.  
Maxillary of colored side with 2 or 3  
rows of small scales terminally,

1950

naked on blind side. muzzle,  
snout and interorbital naked.  
Scales with 24 to 31 basal  
radiating striae; 14 to 20  
radiating apical striae ending  
in as many weak points; circuli  
fine, last distinct or regular  
apically.

D. 50 to 53, fin height  $2\frac{3}{5}$  to  
3 in total head length; A. 37 to  
43, fin height  $2\frac{2}{5}$  to  $2\frac{1}{2}$ ; caudal  
 $1\frac{1}{8}$  to  $1\frac{1}{4}$ , double convex or  
broadly cuneate behind; least  
depth of caudal peduncle  $2\frac{1}{8}$  to  
 $2\frac{1}{2}$ ; pectoral 2 to  $2\frac{1}{3}$ ; <sup>left</sup> ventral  
 $2\frac{1}{2}$  to  $2\frac{2}{3}$ .

7171. West coast of Palani Island.

November 18, 1908. Length 392 mm.

Very dark olive, paler below, with smoky purplish shades. Brassy before eye, on maxillary and terminal third of pectoral. In fading each scale apparently with bronze mark.

Somewhat obscure stripes, below slate and undulating. Dorsal very dark brownish orange, becomes brassy in fading, more or less crossed by 4 or 5 bars nearly diameter of pupil. Anal like dorsal. Caudal fins purplish, without bars. Paired fins with brassy shades.

Colored side (right or left)  
uniform umber, uncolored  
side whitish. In young sometimes  
3 paler or grayish transverse  
bands on body and another at  
caudal base, often pale basal  
caudal band persistent with age.  
Iris dark neutral gray. Dorsal  
and anal usually little darker  
than body color, or more dusky  
and narrowly edged paler.  
On blind side vertical fins all  
dusky terminally.

Arabia, Persian Gulf, Portuguese  
East Africa, Zanzibar, India,  
Malaya, East Indies, Philippines,  
Indo China, China.

975

width. Anal like dorsal, with hyaline  
at base very indistinct, very similar  
to body color; plumbeous bars 3.

Caudal dusky indian purple. Pectoral  
yellowish olive, shades bright lemon  
yellow on terminal third, extreme edge  
hyaline. Ventral membranes yellowish,  
rays with purplish shades.

A 653. Simaluc, Sibi Sibi Island.

September 23, 1909. Length 348 mm.

A 834 and A 854. Jalise Island.

November 9, 1909. Length 215 to 350 mm.

A 1404 and A 1405. Tampusana Island.

December 21, 1909. Length 245 to 265 mm.

A 573. Tutu Bay, southern Jolo. September  
19, 1909. Length 378 mm.

<sup>1932</sup>  
4208, ✓ Corregidor Light, S. 89° W.,  
D. 5361.

7.2 miles (lat. 14° 24' 15" N., long.  
120° 41' 30" E.), Manila Bay.

In 12 fathoms. February 8, 1909.  
Length 153<sub>1</sub> mm. <sup>to 263. Smaller dextral, larger sinistral.</sup> ~~to 263. Smaller dextral, larger sinistral.~~

19408. Iloilo market. March  
28, 1908. Length 128 mm. Dextral.

Two examples. Manila market.  
December 12, 1907. Length 133 to  
148 mm. Larger dextral, smaller  
sinistral.

8051. Manila market. March 18,  
1908. Length 127<sub>1</sub><sup>mm.</sup> Dextral.

20094. Manila market. July  
11, 1908. Length 138 mm. Sinistral.

covered with indistinct plumbeous  
vermiculations. yellowish stripe through  
eye, yellowish following line of gill  
opening. About breast and pectoral  
axil. Iris brown with golden lines on  
edges. Teeth brownish. Caudal spine  
dusky on under side, top of spine  
black, beel colorless, socket greenish.  
Dorsal yellowish olive, crossed by oblique  
plumbeous bars,  $\frac{2}{3}$  pupil width  
from in front upward; upper begins  
at first spine base, rises to near tip of  
fourth, continued parallel to edge of  
vertical of fin; above ground color  
more orange, narrowly margined black;  
other bars 6; fin base bluish plumbeous,  
forming narrow stripe about half pupil

1953

17605, 17606. Manila market.

July 29, 1908. Length 200 to 215 mm.

Larger sinistral, smaller dextral.

6730. Manila market.

December 5, 1908. Length 272 mm.

Sinistral.

8562 to 8568. D. 5442. San  
Fernando Point Light, N.  $39^{\circ}$  E.,  
8.4 miles (lat.  $16^{\circ}30'36''$  N., long.  
 $120^{\circ}11'06''$  E.), ~~Cuyo~~ west  
coast of Luzon. In 45 fathoms.

May 10, 1909. Length 244 to 418

mm. Two dextral, others

sinistral.

mottling; head and body anteriorly  
 with more or less yellowish wash,  
 becomes distinct as sort of stripe  
 through eye. Dorsal and anal broadly  
 streaked with body color, afterward  
 fading to yellowish and slaty purplish.  
 Caudal like body. Pectorals yellowish,  
 hyaline terminally. Ventrals tinged  
 yellowish.

7113 and 7114. Port San Pio Quinto,  
 Camaguion Island. November 12, 1908.  
 Length 245 to 260 mm.

4887. Viasi Island, from fishermen.  
 February 16, 1908. Length 354 mm. Forehead  
 and front part of back dark olive,  
 posteriorly from about middle of dorsal  
 and obliquely toward ventral base

7856. D. 5358. Sandakan<sup>1954</sup>  
Light, S.  $34^{\circ}$  W., 19.7 miles (lat.  
 $6^{\circ} 6' 40''$  N., long.  $118^{\circ} 18' 15''$  E.),

Jolo Sea: In 39 fathoms.

January 7, 1908. Length 265  
~~ft~~ mm. dextral.